

Response to EPA Comments on the Site-Wide Groundwater Interim Corrective Measures Study Report (Revision 0) Sections 1 to 4

1. Because the corrective measure study report is being provided as 4 sequential submissions, the document title should be changed to reflect this process. The document title should be changed to: "Sitewide Groundwater CMS Report, Submission 1 (Sections 1 – 4)". In addition, there should be a description of this process in the document itself, not just the cover letter, either in the first paragraph of Section 1 (Introduction) or in an executive summary, that explains the process, the number of submissions that will complete the CMS, and what each submission will contain (i.e., the same description contained in the cover letter).

*TPA Response: Concur. The document title has been updated, and additional information has been added into Section 1.0. However please note – once this report is finalized and all sections are included, this will be removed.*

2. Section 1.2 Approach for Corrective Measures Study – This section states that at issue are volatile and semi-volatile organic compounds. Other constituents of concern are present, including metals and PCBs. Revise this statement to include all constituents of concern.

*TPA Response: Concur. Statement has been revised.*

3. Section 1.2 Approach for Corrective Measures Study – The third bullet states: develop and evaluate alternatives to reduce levels of COCs in groundwater to the extent practicable *such that* any transport of COCs in groundwater to or across the shoreline/property boundary remains below levels of human health and ecological concern. In contrast, the CMS work plan stated: develop and evaluate alternatives to reduce levels of COCs in groundwater to the extent practicable *and* migration of contaminated groundwater across the shoreline/property boundary. The CMS work plan had more appropriate language because it addressed both the cross-media transfer from groundwater to surface water and pore water, but also resource restoration objectives site wide. Alternatives to achieve cleanup levels throughout the property, not just at the property boundary, must be screened and evaluated (to be provided in the third and fourth CMS submissions). The corrective action objectives (levels, point of compliance, time frame) may be different for groundwater to surface water/pore water versus the resource restoration objective, but remedies for both must be evaluated.

*TPA Response: Wording updated to: "develop and evaluate alternatives to reduce levels of COCs in groundwater and reduce potential migration of contaminated groundwater across the shoreline/property boundary to the extent practicable".*

4. Section 2.1.3.2 Groundwater Quality in the Slag Fill Unit – The first paragraph in this section refers to Figure 5 (Shallow Zone Potentiometric Surface) and Figure 6 (Intermediate Zone Potentiometric Surface), but the text of the paragraph describes groundwater presence in slag relative to the 1916 shoreline, which would appear to more appropriately reference what is shown in Figure 3 (Approximate Shoreline 1916) and Figure 4 (Site-Wide Groundwater Saturated Slag Thickness).

*TPA Response: Concur. Reference updated to Figure 3.*

5. Section 3.3.1, Human Health Potential Receptor

- a) Off-site recreational waders are not just exposed to surface water. Waders are exposed to aquatic sediment, and risk analysis is not credible without including that exposure. Existing sediment data from the *Southeast Area Sediment Assessment, Second Round of Sample Collection* (Weston, 2018) can be used for this analysis. Revise this and all applicable sections accordingly.

*TPA Response: This receptor analysis has been updated to include potential exposure to aquatic sediment.*

- b) The off-site human health risk analysis is incomplete without addressing potential bioaccumulation of COCs from surface water/pore water into consumable species (game fish and crabs) for a recreational fishing exposure. Whether or not this exposure pathway is determined to be negligible, it must be included for completeness. Revise accordingly.

*TPA Response: An off-site recreational user with potential exposure via fish / crab ingestion has been added.*

6. Section 3.3.2, Ecological Potential Receptors

- a) Revise the final sentence of the top paragraph on p. 12 as follows: “Based on this analysis, ~~current~~ groundwater discharges ~~are~~ ~~were~~ not adversely impacting pore water quality **in 2015** along the northwest shoreline.” Revise the second paragraph on p. 13 similarly, using 2015 for the northwest shoreline and 2017 for the southeast shoreline.

*TPA Response: Concur, edits made in two locations.*

- b) The first bullet on p. 12 is missing acenaphthene for the five PAHs exceeding screening levels. Revise accordingly.

*TPA Response: Concur, revised.*

- c) The first sentence of the final paragraph of this section – “Based on the review of the USEPA offshore studies, current groundwater discharges are not adversely impacting the observed pore water quality or sediment quality along the shoreline” - is inaccurate. The Southeast Area EPA study did not collect or evaluate pore water samples, so no conclusions can be drawn regarding Southeast offshore pore water. Revise this and all applicable sections accordingly.

*TPA Response: The report had been updated to clarify that we do not have pore water samples from the entire site.*

- d) The final paragraph of this section can only draw conclusions based on 2015 and 2017 data. Current conditions can be theorized based on that data, but not proven.

*TPA Response: Paragraph has been updated to reference those dates. However, we have also noted that for areas outside the RWM and CPA, there is no reason to believe that conditions have changed significantly due to any potential discharges from onshore areas.*

- e) Groundwater cleanup levels must be protective of both pore water and surface water, not only surface water as stated in this section. Surface water quality criteria will be protective of pore water, but without mixing zone considerations, although some limited attenuation may be warranted. Revise this and all applicable sections accordingly.

*TPA Response: Report has been revised to note that groundwater cleanup levels will be developed to be protective of ecological receptors, specifically of surface water*

*concentrations (after mixing and attenuation) and pore water concentrations (after attenuation).*

7. Section 3.3.2, Ecological Potential Receptors and Table 1

- a) For zinc, Table 1 shows that the maximum shoreline concentration (192 ug/L) exceeds the aquatic life saltwater chronic criterion (81 ug/L), which is the criterion of concern, not the MCL. Revise to describe the distribution of the shoreline zinc results in comparison to 81 ug/L, with applicable conclusions.

*TPA Response: This table has been updated to include an assessment of sediment COPCs from both the EA 2016 and the Weston 2018 offshore studies. It has been updated to include geometric mean concentrations for shoreline monitoring wells site-wide. All geometric mean concentrations are compared to the aquatic life saltwater chronic criterion.*

- b) Provide the full reference for EPA 2017 as a footnote to Table 1.

*TPA Response: Concur, full references added for all sources.*

- c) For dibenzo(a,h)anthracene, the maximum concentration is not below the MCL as stated in Table 1, but it is below the EPA 2017 value, which is the relevant value. Revise accordingly.

*TPA Response: Concur, revised.*

8. Section 3.4.1.2, On-Site Utility Workers, Dermal Contact and Table 3

- a) The RBSL equations presented in this section (first to third equations) appear to be rearrangements of Equations 3.2 – 3.4 in the EPA Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), to solve for the groundwater concentration (ug/L) instead of DAevent. However, in order to do this, DAevent must be known. This section then proceeds to incorrectly substitute DAevent (mg/cm<sup>2</sup>-event) for DAD (mg/kg-day) in RAGS(E) Equation 3.1. Those cancer and noncancer equations on p. 15 of this section actually result in a value with units of ug/cm<sup>2</sup>-day (the mg to ug conversion is unnecessary because this whole approach does not work), showing that this substitution cannot be done. The first equation on p. 14 does not produce final units of ug/L, instead something like mg/event-L-day.

*TPA Response: These equations are EPA RSL equations for Resident Tapwater / Dermal Contact. There are no EPA RSL equations for composite workers or outdoor workers for dermal contact with groundwater. So, these equations have been utilized as a conservative approach (as has been done by other states and consultants). For clarity, we have added units into the report text for all variables, and more clearly referenced the source of the equations. All units work out correctly.*

- b) One possible method to determine the protective groundwater concentration for the dermal groundwater exposure is the following, as long as the EPA RAGS(E) equations are used exactly as provided in RAGS(E). Using the DAD (dermal absorbed dose) equation 3.1, set the DAD to the chemical-specific slope factor or reference dose, and solve for DAevent. Then use the DAevent equations 3.2 – 3.4 to solve for Cw. Convert Cw (mg/cm<sup>3</sup>) to preferred groundwater units after solving equations 3.2 – 3.4. Adjust Cw to the target cancer risk or hazard quotient.

*TPA Response: Refer to previous response.*

9. Section 3.4.1.2, On-Site Utility Workers, Vapor Inhalation

- a) Revise this section to cite the source of the equations -VDEQ Construction Worker Trench Model.

*TPA Response: Text added to cite VDEQ equations.*

- b) For the first two equations to work, ET/24 must instead be 8 hours/day x 1 day/24 hours, as is done in the RSL Construction Worker equations. Revise accordingly.

*TPA Response: We have revised the equation to more clearly show the conversion factor, and have revised the ET for utility workers to 8 hrs (4 hrs originally based on VDEQ 2014 guidance, updated to 8 hrs based on VDEQ 2018 guidance).*

- c) The equation given for K (overall mass transfer coefficient) on p. 15 is not consistent with the VDEQ equation for K. Explain and revise as necessary.

*TPA Response: After review, the equations appear to be the same. However, we used  $H'_{@T_{gw}}$ , which is already adjusted for groundwater temperature. For consistency with the VDEQ equations, we will revise the equations.*

10. Section 3.4.1.2, On-Site Utility Workers, Combined Exposure Routes - This section states “The calculated RBSL for PCBs and Benzo[a]pyrene was less than the drinking water standard (i.e., MCL), so the drinking water standard will be used as the RBSL for PCBs.” This statement is irrelevant because drinking water will be a prohibited use of the Site groundwater. Delete accordingly.

*TPA Response: This text has been deleted.*

11. Section 3.4.1.3, Off-Site Recreational Waders, Dermal Contact

- a) Revise the dermal contact equations for the recreational wader according to the comments above and below for On-Site Utility Workers, Dermal Contact.

*TPA Response: As discussed in the response to comment 8.a), these are the EPA RSL equations for Resident Tapwater / Dermal Contact. There are no EPA RSL equations for composite workers or outdoor workers for dermal contact with groundwater. For clarity, we have added units into the report text for all variables utilized in equations, and to clearly note where the equations are from. We have revised the screening level calculations to account for dermal contact with sediment.*

- b) Provide the data sets and geometric means used for the mixing factor, as an appendix to the report.

*TPA Response: Appendix C has been added, to include the datasets and calculations.*

12. Section 3.4.2, Ecological Receptors - The first sentence of this section is in error: pore water quality is unknown for the southeast area and dated for the northwest shoreline. Revise accordingly to include groundwater cleanup levels for porewater with no mixing zone.

*TPA Response: This section has been updated to summarize where sampling previously occurred for pore water, surface water, and sediment sampling. It then noted that groundwater cleanup levels will be developed for pore water (with attenuation only) and surface water (with attenuation and mixing).*

13. Section 3.4.3, Resource Restoration

- a) It appears that the industrial non-potable water user in this section is intended to be the worst-case receptor for groundwater exposure, such as a worker for a car or truck wash

that utilizes groundwater. Confirm and describe accordingly in this section.

*TPA Response: Correct, this is intended to be the worst-case receptor. Additional text added to Sections 3.3.3 and 3.4.2 to clarify.*

- b) Revise the dermal contact equations for the industrial non-potable water user according to the comments above and below for On-Site Utility Workers, Dermal Contact.

*TPA Response: Refer to response to comment 8.a).*

- c) The VDEQ trench model is not applicable to the industrial non-potable water user. Revise to use the RSL Table construction worker, standard vehicle traffic equations.

*TPA Response: The RSL Table construction worker, standard vehicle traffic equations provide soil exposure calculations and result in screening levels in mg/kg. We are looking to calculate groundwater screening levels that will be protective of the industrial non-potable water user. After discussing with EPA, we have revised the vapor inhalation portion of the Composite Worker. First, the EPA RSL equation for composite worker air was utilized to calculate an outdoor air concentration. Then, the calculated outdoor air concentration was converted to an applicable groundwater cleanup level using a simple box model. All details are included in the revised text.*

- d) This section states “These screening levels were compared with the groundwater screening levels for the protection of ecological receptors. The lower of the two screening levels was selected as the Resource Restoration screening level, . . .” This does not seem to be a relevant comparison. Screening levels for the protection of ecological receptors will apply to all perimeter wells, unless these are greater than the screening levels for off-site waders or the requested screening levels protective of consumers of fish/crab offshore. The lowest of the human health-based screening levels will apply to interior wells. Revise accordingly.

*TPA Response: After talking with EPA, both portions of the Resource Restoration screening level will be applied across the entire site. Text updated in Sections 3.3.3 and 3.4.3.*

- e) This section states “For several compounds, the calculated Resource Restoration screening level was lower than the applicable drinking water criteria (MCLs). For these compounds (Cyanide, Chromium, PCBs, and Benzo(a)pyrene), the applicable MCL was utilized as the Resource Restoration screening level.” This statement is irrelevant because drinking water will be a prohibited use of the Site groundwater. Delete accordingly.

*TPA Response: This text has been deleted.*

- 14. Section 4.0, Nature and Extent of Groundwater Impacts - Revise this section according to all comments above and below.

*TPA Response: This will be revised once all changes to the screening levels are made.*

- 15. Table 2, Target Media Cleanup Levels

- a) The MCL column is unnecessary in this table since potable use of Site groundwater will be prohibited. Delete accordingly.

*TPA Response: While potable water use will be prohibited, the MCL remains a helpful reference point.*

- b) It is stated in the Ecological Receptors column, under GW to PW, “Not Applicable –

ERA indicated no unacceptable risk”. This is incorrect; the Southeast Area EPA study did not collect or evaluate pore water samples, so no conclusions can be drawn regarding Southeast offshore pore water. Revise to correct and provide target media cleanup levels for pore water with no mixing zone.

*TPA Response: This has been updated. GW levels have been established based on both pore water and surface water.*

- c) The resource restoration column includes the title “Discharge and Industrial Non-Potable Water User.” Does discharge refer to dewatering? If so, no groundwater values were provided for the dewatering use. Revise accordingly.

*TPA Response: No, discharge does not refer to dewatering. This is intended to be a worker that utilizes groundwater for non-potable uses (i.e. truck washing) and then discharges that used groundwater. To keep in line with the text, this header has been revised to “Industrial Non-Potable Water User”.*

- d) The column for on-site industrial worker, VISL, excludes VISLs for 1,2,4- and 1,3,5-trimethylbenzene. Revise to include 1,000 ug/L for 1,2,4- and 730 ug/L for 1,3,5- (HQ = 1).

*TPA Response: Concur, Table 2 revised.*

- e) For chromium, revise to use toxicity criteria for chromium III, insoluble salts rather than chromium VI which is also in this table.

*TPA Response: There is no toxicity criteria in the EPA RSL tables for chromium III, insoluble salts for SFO, IUR, or RfC. So those values will remain the same. We have updated the value for RfD to reflect the chromium III, insoluble salts value.*

#### 16. Table 3, Exposure Parameter Values

- a) The target cancer risk set at 1E-5 fails to account for the greater than 10 carcinogenic groundwater COCs. Revise to set the target cancer risk for each carcinogenic COC to not exceed a cumulative 1E-4 cancer risk.

*TPA Response: For human health calculations for on-site utility worker, on-site composite worker, and off-site recreational wader, a TR of 1E-06 was utilized, in order to ensure that cumulative carcinogenic risk for groundwater remains below acceptable risk levels.*

- b) The target hazard quotient set at 1 fails to account for the multiple noncancer groundwater COCs. Revise to segregate these by target organ, with any multiples exceeding a hazard quotient of 1 to be set at the applicable fraction.

*TPA Response: For human health calculations for on-site utility worker, on-site composite worker, and off-site recreational wader, COPCs were broken out by target organ. The THQ of 1.0 was divided by the number of COPCs contributing to that target organ HQ, in order to obtain a target HQ per target organ per COPC. Screening levels were then calculated for each COPC/target organ.*

- c) Exposure Frequency units are days/year, not events/year.

*TPA Response: Based on the equations utilized, we are using events/year. However, they essentially work out to the same thing.*

- d) Exposure Time units are hours/day, not hours/event.

*TPA Response: Based on the equations used, we are using hours/event. However, it*

*essentially works out to the same thing.*

- e) Correct the omission of units for body weight.

*TPA Response: Updated in Table 3.*

- f) The Surface Area value for workers should be revised to 3,527 cm<sup>2</sup> (EPA Recommended Default Exposure Factors 2014).

*TPA Response: Updated in Table 3. Reference added to bottom of table.*

- g) The VDEQ Trench Model value for Air Changes per Hour is 2, not 360 or 46 as shown in this table. Revise all ACHs to be consistent with VDEQ exposure parameters.

*TPA Response: Revised to use an ACH of 2 for the Utility Worker scenario.*

- h) The VDEQ Trench Model value for trench length is 2.44 m. Assuming the width as 1 m, Area of trench = 2.44 m<sup>2</sup>. Revise accordingly.

*TPA Response: Concur, trench area updated to 2.44m<sup>2</sup> based on trench length of 2.44m.*

- i) The VDEQ Trench Model value for trench depth is 4.88 m. Assuming the width as 1 m, Volume of trench = 11.9 m<sup>3</sup>. Revise accordingly.

*TPA Response: Trench area updated to 5.95m<sup>3</sup> based on trench length of 2.44m and trench depth of 2.44 m (based on groundwater less than 15 ft bgs).*

17. Table 4, Chemical-Specific Criteria and Parameters

There are no full references given for this table. The phrases used are meaningless. Revise to provide full citations for all source documents used.

*TPA Response: Full references have been added.*

18. Table 5, Ecological Receptor Screening Levels

- a) The EPA 2017 values for PAHs are a last resort, because those values have been modified to be protective of benthic organisms only, not organisms in the entire water column. Therefore, replace the values for naphthalene, fluoranthene, fluorene, and pyrene with the EPA Region III BTAG marine benchmarks. Replace the values for benzo(a)pyrene, benzo(a)anthracene, and vinyl chloride with the EPA Region III BTAG freshwater benchmarks.

*TPA Response: After discussions with EPA, we have separate hierarchies for surface water and pore water. The EPA 2017 PAH screening levels are appropriate for pore water, but not surface water. Text and tables have been updated to clarify.*

- b) Revise to use the value for 1,2,4-trimethylbenzene as a surrogate for 1,3,5-trimethylbenzene.

*TPA Response: Tables 2 and 5 have been updated to include the value for 1,2,4-trimethylbenzene as a surrogate for 1,3,5- trimethylbenzene.*

- c) For aluminum and 1,1-biphenyl, use the EPA Region III BTAG freshwater benchmarks.

*TPA Response: Tables have been updated to utilize the EPA Region III BTAG freshwater benchmarks for aluminum and 1,1-biphenyl, although a note has been added that these values are based on freshwater benchmarks, and not marine water benchmarks.*

- d) For 2,4-dimethylphenol, 1,1-dichloroethane, methyl ethyl ketone, and cis-1,2-dichloroethene, use the NOAA SQUIRT freshwater values.

*TPA Response: Tables have been updated to utilize the NOAA SQUIRT freshwater*

*values for 1,1-dichloroethane, methyl ethyl ketone, and cis-1,2-dichloroethene, although a note has been added that these values are based on freshwater values, and not marine water values. There is no NOAA SQUIRT freshwater value for 2,4-dimethylphenol.*

- e) For 1,4-dioxane and pyridine, EPA's Ecotox database contains aquatic toxicity records for these chemicals, which can be used to calculate a rough benchmark, revise accordingly.

*TPA Response: After pulling information from the RAIS database, screening levels have been selected for all remaining COPCs.*